

# PSYCHE.

## CADDIS-WORMS OF STONY BROOK.

BY CORA H. CLARKE, JAMAICA PLAIN, MASS.

That part of Stony Brook in which I have made collections lies within the limits of the City of Boston. It is about eight feet wide, and its depth varies from two to twenty-four inches. In some places it flows slowly, in others rapidly; here the bottom is muddy, there pebbly. Fresh-water algae of several species, a great variety of other water plants, and many different animals are found in it; among the animals are fresh-water sponges, Polyzoa, planarians, mollusks, water insects of all kinds, and occasionally a fish, newt, or turtle. But the most interesting of all its inhabitants are the larvae of the Trichoptera or Caddis-worms. I have found in all about twenty distinct species, representing each of the seven families.

**PHRYGANEIDÆ.** Of this family I have found only one representative, a species of *Neuronia*. Possibly it is *Neuronia stygipes*, but the only imago which I have succeeded in rearing was imperfect. It emerged from the aquarium on April 5th. The larva has a yellow face striped with black, and is very restless and nervous in its movements, continually travelling about the aquarium, making sad havoc among its inhabitants, eating dragon-fly larvae as large as itself, other caddis worms, and

indeed any insect which it can catch. It also devours raw beef with relish. The case of this larva (fig. 1\*) is made of quadrangular pieces of leaves, fastened together by their edges and arranged in rings rather than in the spirals which M'Lachlan tells us is characteristic of the genus. Three or four or



Fig. 1.

sometimes more of these rings, make the length of the case, which, when full-grown, may be 35 mm. long.† When the *Neuronia* larva is not satisfied with its case it bites off a ring at one end, replaces it with a freshly constructed ring, and then turns within the case, and does the same at the other end. If pushed out of its case, and deprived of it, it will make a new one in a night. Sometimes this species is tolerably abundant, and again for several years, it is quite scarce.

**LIMNOPHILIDÆ.** I have found five or six species of this family. The commonest of these is *Hallesus maculipennis*, the larvae of which are very

\* All the cuts are of the natural size excepting fig. 23 and the operculum in fig. 8.

† I have found that with most species of caddis-worms the case of the pupa or adult just before pupating is shorter than that of the growing larva.

abundant, crawling over the water plants in the brook. They can sometimes be seen under the ice in a submerged meadow. The cases (fig. 2) are made of little sticks and other vegetable bits, put on transversely, and those of the growing larva have a bristling appearance, probably similar to those Isaac Walton calls "Ruff-coats," but the case of the pupa is a smooth cylinder. At this time it is about 15 mm. long, and is closed with a net at each end, as is also the case of *Neuronia stygipes*. These nets or disks which close the apertures, are indicated on some of the cuts. The larvae frequent rather quiet water, and therefore are comparatively easy to keep alive in an aquarium, but all species need especial care during pupation, which is the critical period of a caddis-worm's life. I have found them pupating in the brook at the end of May.

A larva, which is probably that of *Limnophilus pudicus*, makes a slightly curved case (fig. 3) of little, rounded, imbricating bits of leaves. It is not very common, and I have never reared it.



Fig. 4. fragments of moss, a little



Fig. 2.



Fig. 3.

sand or gravel or a few shells. I have never found a case of any species composed entirely of shells. When sticks are used they are put on longitudinally, and usually project beyond the ends of the cylinder. During pupation each end is closed with a net or grating. I have found a larva pupating at the end of May and also in June. The adult case is about 24 mm. long.

I have found larvae similar to those of *Anabolia*, in cases made entirely of pieces of sedge leaves, arranged lengthwise with long projecting ends, but though I once reared the imago, which also resembles that of *Anabolia*, I have not succeeded in obtaining its name.

Another case of about the same size (fig. 5), with an imago resembling that of *Anabolia*, appears to be rare. It is made entirely of leaves, and in cross section is three angled, with projecting corners. This larva also is not unlike that of *Anabolia*.



Fig. 5.



Fig. 6.

A similar larva makes a case (fig. 6) of bark and sticks, about 20 mm. long but slightly flattened, with a little stick at each side, and imbricating bits of leaves between.

I sometimes find in the brook the larva of a species of *Stenophylax*. The case (fig. 7) is cylindrical, about 22 mm. long, and is made entirely of gravel. During pupation it is closed with a net at each end.



Fig. 7.

SERICOSTOMATIDAE. I have found six species of Sericostomatidae, of which the most interesting belong to Helicopsyche. Species of this genus make small, snail-like cases of sand, gravel or mud. The one whose case is figured (fig. 8) uses coarse sand. I find it crawling on stones or weeds where the current is rapid. In pupation the mouth of this snail case is closed with an operculum in which is a small eccentric slit. At the apex of the spiral, which represents the back door of the larva, there is a lacunose disk. These larvae were found pupating on June 2nd.



Fig. 8.



Fig. 12.



Fig. 13.

A species of *Brachycentrus* is sometimes common and sometimes scarce. It makes a quadrangular case (fig. 9) of a few square bits of bark, fastened together at their edges.



Fig. 9.



Fig. 10.

Once I found a number of empty cases (fig. 10) made of sand; they were small, club-shaped, and curved, and probably the makers belong in this family.

One of the most abundant species in Stony Brook (and in other brooks where I have collected) belongs "near *Mormonia* or *Trichostoma*."



Fig. 11.

The case (fig. 11) is arched on the back, and flat or slightly concave below, and is made of gravel, with small stones on each side, and is about 12 mm. long. I have found similar cases in Jamaica Pond. During pupation the cases are closed at each end with a small stone, but to insure a current of water through the case,

each of these little stones is attached to the case by a row of short threads, looking not unlike the teeth of a moss capsule. Fig. 12 shows their appearance at the ventral side of the head end, where is the point of attachment.

Even more abundant than this species is one which makes cylindrical, slightly curved tubes of sand, (fig. 13), which, when their inhabitants are pupating, often are found attached to each other in large masses.

At this time each end of the case is closed with a grain of gravel, and I cannot see what provision is made for the respiratory current. The larva, however, has a small hole at the side of the sand grain which serves to close the posterior end of his case. The case of the growing larva flares somewhat at the anterior end, but that of the adult is evenly cylindrical. I have an imago of this species which I reared from the egg, in the tranquil waters of my aquarium, but when the pupae are taken from the brook, they should be kept in running water to transform. On April 17th, 1890, I found multitudes of these cases in Stony Brook near the Mount Hope station. I supposed that the larvae had pupated, since both ends were closed, but keeping out of water for a few minutes one of the stones to which they were attached, most of the little larvae opened their front doors, and stretched far out to see what had become of the brook. By another month, however, they really had changed to pupae. Some of the imagos of this species,

which I reared in my aquarium, came out with a large tubercle on each side of the head. These tubercles are supposed to be organs of scent.

Another species of the same family makes a case (fig. 14) in shape so like the preceding that I at first confounded the two, but the larva of this latter species has a yellow head striped with black, while that of the former has a plain gray head. Moreover the yellow-faced one uses finer materials, and before pupation shuts itself in at each end with a disk, instead of a grain of gravel. One of the imago emerged on June 15th.



Fig. 14.

LEPTOCERIDAE. (MYSTACIDAE.) I have found in Stony Brook four species belonging to this family, and another in Jamaica Pond. This last species makes small cases, 9 mm. long, of little sticks, arranged transversely like those of *Hallesus*. The imago is a pretty little gray spotted creature, but I have not been able to ascertain its name.

But the prettiest of my Stony Brook Leptoceridae is colored a soft yellowish brown, and has very long slender antennae, which indeed are characteristic of the family. It is said to belong "near *Setodes ignita*." The larva is most abundant on the plants of *Callitriche verna* or "water starwort" from the leaves of which it usually makes its case. This (fig. 15) is a delicate tapering cone, about 20 mm. long, and the bits of leaf



Fig. 15.

are arranged side by side in a spiral, which in some individuals winds to the right, in others to the left. In a tube 21 mm. long, there were 11 turns to the spiral. The little larva protrudes its long slender legs from the case, and swims merrily about in the water. It pupates in June and July, and is easy to rear in confinement. The case of the pupa is about 10 mm. long, and is evenly cylindrical, each end being closed with a disk which has a small round hole in the centre.

The larva of *Mystacides nigra* also swims with freedom and is abundant both in Stony Brook and Jamaica Pond. Its little case (fig. 16), about 10 mm. long, varies much, both as to materials and their arrangement, but is chiefly composed of bits of bark, and little sticks, sometimes filled in with fine sand. It is easy to rear, and the little black imago may be recognized by a peculiar bend in each of the upper wings, which makes them look as if broken.



Fig. 16.

A species of *Molanna*, a genus considered one of the most interesting of those found in Great Britain, is often quite abundant on the sandy bottom of the brook, but I have never reared it, though it does well in an aquarium, until it pupates; it makes a flattened case (fig. 17), with an arched dorsal side, which projects far above the anterior end, so that nothing whatever is seen of the larva when it is crawling on the bottom. The appearance is as if some of the sand



Fig. 17.



grains were walking off in a mass. This protecting portico disappears during pupation.

A larva, which in some years is quite abundant, spins for itself a case of black silk, weighted with vegetable matter. It is about 15 mm. long, terete, tapering to the rear end, where there is a small hole. The cases of the young are quadrangular at the anterior end, which end during pupation is closed with a thick disk, having in its centre a thinner circular area perforated with holes. In the illustration (fig. 18) the adult case is represented too small. This species does not bear confinement well, and I have never reared it.



Fig. 18.

HYDROPTILIDAE. I have been disappointed at finding only one species of Hydroptilidae in my brook, and this I have not reared. The case (fig. 19) is flat, gray and seed-like, and is attached by its edge to the stones in the brook, where the current is rapid.



Fig. 19.

HYDROPSYCHIDAE. The most interesting species of the order found in Stony Brook, and also abundant in various smaller brooks, weaves for itself a little net, probably for the purpose of catching its food. This species, with its nets, has been found to be very common in other parts of the United States. The net (fig. 20) is upright, supported by a small vertical arch or ring of vegetable bits, and the opening of the larval house is always on the up-stream side of the net. In some places the nets and their accompanying houses are found singly on the bottom, or on



Fig. 20.

the stones in the brook—in other places they are thickly clustered together, or, placed side by side, they may extend nearly across the brook.

The larvae are gray, with an arcuate body, and tufted gills hanging thickly from the under side. They pupate in May. The nets disappear during pupation, and the houses, which, while the larvae were active, were shiftless arrangements of loose vegetable bits, or grains of sand carelessly held together with silk, are now (fig. 21) oblong domes, strongly constructed of little stones, and fastened



Fig. 21.

at their edges to the rocks, pebbles or sticks in the brook. The whole is lined with silk, small openings being left at each end for the respiratory current. These larvae die almost immediately when transferred from the rapidly flowing streams which they affect, to the tranquil waters of an aquarium. But like many other sensitive species, the well-developed pupae can be made to emerge in a set-basin, which has a constant stream of water from the faucet flowing through it.

Another species of this family, belonging to the genus *Plectrocnemia*, makes a tube of mud (fig. 22) which I at first thought must be manufactured by some large worm. I saw the ends of these tubes projecting from the muddy

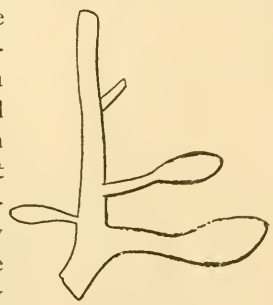


Fig. 22.

bottom of the brook, and by working my fingers about in the soft mud below them brought them out uninjured. But great was my astonishment on opening one of them to find within a slender, delicate, white larva, looking so small in proportion to the size of the tube that I could not believe it to be the maker, till researches into the other tubes revealed similar occupants in all of them. Fig. 23 represents the mouth parts of one of these larvae, enlarged. The tube in the centre is the labium (spinnet) which spins the silken threads, the substance used by all caddis-worms to fasten together the materials of their houses, and fabricate the gratings or disks which protect them during pupation.



Fig. 23.

These Plectrocnemia cases occur in colonies, but this spring, 1891, I could not find any. They pupate in May, and the pupa may be found in a swelling of a vertical tube

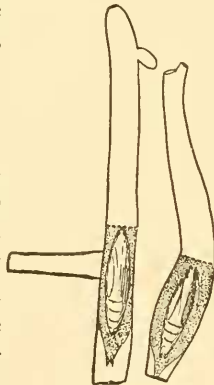


Fig. 24.

(fig. 24). I do not understand what use the larvae make of the lateral chambers. Some in my aquarium, however, only constructed horizontal tubes, in which they lived and transformed.

**RHYACOPHILIDAE.** In this family the pupa is enclosed in a thin brown leathery cocoon. I have found two species, but I am not sure whether I obtained them in Stony Brook, or in its smaller tributaries. In one of them the case is of no regular shape, being composed of a very few stones, proportionately large.

The other case (fig. 25) is quite peculiar. It is abundant in the Bussey Brook, and I have also found it in Brookline and Dedham. It is about 9 mm. long, roundish oblong in shape, and strongly arched above, and made of coarse sand or gravel. On turning it over, one sees a shelf of fine sand, like the thwart of a boat, across the middle of the case. This disappears during pupation. In Bussey Brook I found one pupa on May 9th, 1891, though most of the cases were still occupied by the larvae.



Fig. 25.

## HALISIDOTA CARYAE.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

A mat of eggs was found on the under side of a leaf rather high up in a thorn-tree, on June 28th, 1891, Brookline, Mass. The eggs were close

together, about one hundred in number, hemispherical, the flat side being on the leaf. When found they were of a leaden color, and soon each showed a